NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

CONTOUR STRIPCROPPING

(Acre)

CODE 585

DEFINITION

Growing row crops, forages, small grains, or fallow in a systematic arrangement of equal width strips on or near the contour of the field slope.

PURPOSES

- To reduce sheet and rill erosion
- To reduce transport of sediment and other water-borne contaminants

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on sloping land where crops are grown.

Although this practice may be applicable on steeper slopes, it will be less effective on slopes exceeding 12 percent.

The practice has the greatest impact where cropped or fallow strips having less than 10 percent cover are alternated with close grown and/or grass/legume strips (Cover-Management Condition 1-2), or strips of *residue management, no/till/strip-till* with 75 percent or greater surface cover (Cover-Management Condition 3). Cover-Management conditions are described in **Appendix 1** of this standard. The practice is not well suited to rolling topography having a high degree of slope irregularity.

The standard does not apply to situations where the width of alternating strips are not generally equal or where the land is treated with c*ontour buffer strips* or f*ield strip cropping.*

CRITERIA

General Criteria Applicable to All Purposes

Alignment of Strips

Where more than one strip boundary will be placed on the hill slope, strip boundaries shall run parallel to each other as long as their grades meet the row grade criteria. If unachievable, establish a new baseline at a distance up or down the slope equal to some multiple of strip widths that will limit the number of correction strips (non-uniform width strips) to the minimum needed to keep all strip boundaries within row grade limits.

All tillage and planting operations will follow the contour line established.

Where contour row curvature becomes too sharp to keep machinery aligned with rows during field operations, establish sod turn strips on sharp ridge points. On ridge tops, where grades are within row grade limits, row crops may be planted in these turn strip areas. Plant these areas last and harvest these areas first. When establishing *grassed waterways* in drainage ways, establish vegetation at least up to that point of sharp curvature. These strips shall be wide enough to allow the equipment to be lifted and/or turned and meet the same rows across the turn strip. Mow sod turn strips and *grassed waterways* at least once yearly after ground-nesting birds have hatched. Harvesting is optional.

Strip Width

Base strip widths on the slope length used for erosion prediction. Erosion-prone strip widths

shall not exceed 50 percent of the slope length or 150 feet whichever is less. The erosion-resistant and erosion-prone strips shall be of equal width, except for any correction strip needed to keep strip boundaries within prescribed row grade limits. The correction strip may vary in width but shall be no narrower than the widest working farm implement used to traverse the strip.

Minimum Row Grade

Row grades for soils in hydrologic groups C or D or for crops sensitive to ponded water for periods of less than 48 hours conditions, shall be designed with positive row drainage of not less than 0.5 percent.

Maximum Row Grade

The row grade shall be aligned as closely as possible to the contour to achieve the greatest erosion reduction. The maximum grade of row guidelines shall not exceed 2 percent or one half of the up and down hill slope percent used for erosion prediction, whichever is less. Up to 3 percent row grade may be permitted within 150 feet of the approach to a grassed waterway, field border or other stable outlet.

Row grades between strip guidelines shall not exceed the lesser of 4 percent or ½ of the field slope.

Minimum Ridge Height

The ridge height shall be designed to reduce soil erosion compared to that of rows oriented up and down the slope. As a minimum, this practice shall be designed to achieve a 0.5-2 inch ridge height during the period of the rotation that is most vulnerable to soil erosion. Ridge height design will be determined using on site conditions and current erosion prediction technology approved for use.

The minimum ridge height criteria is not required for close-grown crops, such as small grains, when runoff is reduced compared to that of rows planted up and down the slope. As a minimum, plant height shall be at least 6 inches high and the spacing between plants within the row shall not be greater than 2 inches.

The minimum ridge height criteria is not required where the practice *residue management, no-till/strip-till* is used on the contour if at least 50 percent surface residue is present between the rows after planting.

Critical Slope Length

The critical slope length for contour stripcropping is 1.5 times the critical slope length determined for contour farming. A contour stripcropping layout shall not occur on a slope longer than the critical slope length unless supported by other practices that reduce slope length below critical (e.g., diversions, terraces). The computation of critical slope length shall be determined using the Revised Universal Soil Loss Equation, (RUSLE).

Stable Outlets

All diverted runoff from *contour stripcropping* shall be delivered to stable outlets, such as *grassed waterways, field borders, water and sediment control basins, or underground outlets for terraces and diversions.*

Headlands/End Rows

On fields where row crops and tillage are a part of the rotation, keep headlands/end rows in permanent sod where their grades would be steeper than the criteria set forth for strip boundaries.

Additional Criteria to Reduce Sheet and Rill Erosion

Arrangement and Vegetative Condition of Strips

Alternate strips of erosion-prone crops or fallow (Cropland Cover-Management Conditions 4-7) down the slope with strips of erosion-resistant cover (Cropland Cover-Management Conditions 1-3). If condition 3 is utilized as one of the erosion resistant strips, at least 75 percent surface residue cover shall be present. The erosion resistant cover shall be present during periods when erosion is expected to occur.

No two adjacent strips shall be in an erosion-prone condition at the same time during the year. However, two adjacent strips may be in erosion-resistant cover at the same time.

A vegetative cover shall be selected that is tolerant of the anticipated depth of sediment deposition and potential pesticide damage.

Additional Criteria to Reduce Transport of Sediment and Other Water-borne Contaminants

Arrangement and Vegetative Condition of Strips

Erosion-prone crop or fallow strips shall be managed as Cropland Cover-Management Conditions 3-5. Erosion-prone strips shall be alternated down the slope with strips of erosion-resistant cover that meet Cropland Cover-Management Conditions 1-2. The erosion resistant cover shall be present during periods when erosion is expected to occur.

No two adjacent strips shall be in an erosion-prone condition at the same time during the year. However, two adjacent strips may be in erosion-resistant cover at the same time.

A vegetative cover shall be selected that is tolerant of the anticipated depth of sediment deposition and potential pesticide damage.

CONSIDERATIONS

The *conservation crop rotation* on stripcropped fields should be consistent with the farm enterprise crop mix and/or associated livestock operation. These will influence the proportion of row crops, close growing crops, and meadow crops.

To avoid wide fluctuations in acreage of different crops from year to year, fields having identical crop rotations can be set up that are nearly equal in size and have offset years of rotation commencement. The number of fields needed to produce a nearly constant acreage of each crop for each year in the rotation is equal to one half of the years in the rotation. Even-year rotation lengths are preferable to odd-year rotation lengths for ease of design.

Protect areas of existing or potential concentrated flow erosion by any one or more suitable conservation practices, such as *grassed waterways, water and sediment control basins, diversions, terraces, or underground outlets*.

Where row length in any one direction exceeds 500 feet, ridge height and row grades will need to be designed to ensure water flows to a stable outlet.

Design and install the strip layout to best facilitate operation of all machinery used on the strips. To avoid point rows and partial machine passes, lay out strip widths to have some multiple of full width passes by all farm implements, even at unavoidable constrictions.

Prior to design and layout, *obstruction removal* or changes in field boundaries or shape should be considered, where possible and feasible, to improve the effectiveness of the practice and the ease of performing field operations across the slope.

Prior to layout, inspect the field to find key points for commencing layout or getting a full strip width to pass by an obstruction or ridge saddle. Whenever possible, run the strip boundary parallel with fence lines or other barriers, as long as row gradient criteria are met. Account for access road widths when they must cross the field, and adjust the strip boundary on either side accordingly.

When the slope length used in erosion prediction exceeds the critical slope length for the cover-management condition that best characterizes the field to be contour stripcropped, establish structures, such as *diversions* or *terraces*, to reduce slope length below the critical slope length.

When this practice is used in combination with *diversions* or *terraces*, coordinate the strip layout with the diversion or terrace grade and spacing so that strip boundaries will parallel terraces wherever possible within the criteria for row grade. Where grass-back or narrow-base terraces are used, allow for the uncropped width along the terrace so that the same strip width is maintained for all strips in the field.

Retaining as much crop residue as possible on the soil surface by using residue management practices can maximize critical slope lengths. Certain tillage practices, such as uphill plowing and deep tillage with heavy implements, can also be used to increase random roughness, allowing deposition to occur in depressions between soil clods and increase critical slope length. However, if the most erosion-prone strips of the field are kept very rough, in high ridges, and/or under heavy residue most of the year, there is little need for stripcropping as an erosion and sediment control practice because little sediment will be delivered to the protective cover strips. As a consequence RUSLE “P” factor values are approximately equal to 1.

Contour stripcropping may need to be used in combination with other conservation practices to meet the goals of the conservation management system.

Meadow crops generally increase water infiltration into the soil. Where half of the crop rotation is meadow (Cover-Management Conditions 1-2), select RUSLE "P" subfactor values for the next higher soil drainage group. For example: For a field cropped to a rotation consisting of one-half meadow that has a Hydrologic Group C soil, select RUSLE "P" subfactor values developed for Hydrologic Group B.

PLANS AND SPECIFICATIONS

Specifications for installation and maintenance of Contour Stripcropping shall be prepared according to the Criteria, Considerations, and Operations and Maintenance described in this standard, and shall be recorded on specification sheets, job sheets, narrative statements in conservation plans, or other acceptable documentation. Factors such as rotation, ridge height, row grade, or random roughness that are critical to achieving the planned erosion control will be documented in the case file. The "RUSLE Sheet and Rill Erosion Prediction Worksheet" found in the Illinois Field Office Technical Guide, Section I-Erosion prediction is an acceptable form of documentation.

OPERATION AND MAINTENANCE

Conduct all farming operations parallel to the strip boundaries except on end rows that have gradients flatter than the criteria set forth in this standard unless the end rows are in cover-management condition 3.

Plant odd areas and short rows to maximize adherence to the contour and protect sensitive areas. Using no-till in the odd areas and short rows or seeding close-grown crops rather than row crops increase options. Substituting a crop different from one called for in the planned crop rotation, or adjusting the crop rotation due to failed crops or loss of stand, is acceptable, provided neither situation allows two adjacent erosion-prone strips.

Sediment accumulations along the upslope edge of protected strips may need to be smoothed or redistributed to maintain uniform sheet flow along the strip boundary.

When headlands/end rows are in permanent cover, renovate as needed to keep ground cover above 65 percent. No-till renovation of headlands/end rows is recommended but in any case should only include the immediate seedbed preparation and reseeding to a sod-forming crop with or without a nurse crop. Maintain full headland/end row width to allow turning of farm implements at the end of a tilled strip to double back on the same strip.

REFERENCES

Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE); Agriculture Handbook Number 703.

APPENDIX 1

TABLE 1 - COVER MANAGEMENT CONDITIONS

Select the cover management condition that best describes the condition during the 1/4 of the year when rainfall and runoff are most erosive and the soil is most susceptible to erosion. Since the P factor effects are approximate, no provision is made for varying the cover-management condition class during the year.

Description of cropland cover-management conditions used in RUSLE for estimating P-factor values.

Code 1. Established meadow.	In this condition, the grass is dense and runoff is very slow, about the slowest under any vegetative condition. When mowed and baled, this condition is condition 2.
Code 2. 1st year meadow, hay.	In this condition, the hay is a mixture of grass and legume just before cutting. The meadow is a good stand of grass that is nearing the end of the first year. When mowed and baled, this condition becomes a condition 4 for a short time.
Code 3. Heavy cover and/or very rough.	Ground cover for this condition is about 75 to 95%. Roughness would be like that left by a high clearance moldboard plow on a heavy textured soil. Roughness depressions would have the appearance of being 7 inches deep and deeper. Vegetative hydraulic roughness would be like that from a good legume crop, such as lespedeza, that has not been mowed.
Code 4. Moderate cover and/or rough.	The ground cover for this condition is about 40 to 65%. This roughness would be like that left by a moldboard plow in a medium textured soil. Depressions would have the appearance of being about 4 to 6 inches deep. Vegetative hydraulic roughness would be much like that produced by winter small grain at full maturity.
Code 5. Light cover and/or moderate roughness.	Ground surface cover is between 10 to 35% and the surface roughness is like that left by the first pass of a tandem disk over a medium texture soil that has been moldboard plowed. This roughness could also be much like that left after a chisel plow through a medium textured soil at optimum moisture conditions for tillage. Roughness depressions would have the appearance of being on the order of 2 to 3 inches deep. In terms of hydraulic roughness produced by vegetation, this condition is much like that produced by spring small grain at about three fourths maturity.

TABLE 1, cont. - COVER MANAGEMENT CONDITIONS

Code 6. No cover and/or minimal roughness.	This condition is very much like the condition typically found in row cropped fields after the field has been planted and exposed to a moderately intense rainfall. Ground cover is less than about 5% and the roughness is that characteristic of a good seedbed for corn or soybeans. The surface is rougher than that of a finely pulverized seedbed for seeding vegetables or grass.
Code 7. Clean-tilled, smooth, fallow.	This condition is is essentially bare, with a cover of 5% or less. The soil has not had a crop grown on it in the last 6 months or more. Much of the residual effects of previous cropping has disappeared. The surface is smooth, much like the surface that develops on a very finely pulverized seedbed exposed to several intense rainfalls. This condition is found in fallowed and vegetable fields, or in newly sown lawns and hay fields.

Table 2 - GUIDELINES FOR SELECTING RIDGE HEIGHTS

FOR CONTOURING WITH RUSLE

Select the ridge height that best describes the condition during the 1/4 of the year when rainfall and runoff are most erosive and the soil is most susceptible to erosion.

1. VERY LOW (0.5 - 2 in.) RIDGES

- Plants not closely spaced, but with a perceptible ridge height
- No-till planted row crops
- Fields that have been rolled, pressed or dragged after planting
- Conventionally drilled crops when erosive rains occur during or soon after planting
- Clear seeded hay that leaves a very low ridge

2. LOW (2 - 3 in.) RIDGES

- No-till drilled crops
- Mulch tilled row crops
- Conventionally planted row crops with no row cultivation
- Conventionally drilled small grain when erosive rains are uniformly distributed throughout the year
- Winter small grain when runoff from snowmelt occurs during winter and early spring
- Transplanted crops, widely spaced

3. MODERATE (3 - 4 in.) RIDGES)

- Conventionally (clean) tilled row crops with row cultivation
- High yielding winter small grain crops when erosive rains are concentrated in the late spring after plants have developed a stiff, upright stem
- Transplanted crops that are closely spaced and/or in narrow rows

4. HIGH (4 - 6 in.) RIDGES

- Ridge tilled crops with high (4-6") ridges during periods of erosive rain

5. VERY HIGH (Greater than 6 in.) RIDGES

- Ridge tilled crops with very high (6+") ridges during periods of erosive rains
- Hipping, bedding or ridging with very high ridges during periods of erosive rains